J. Raptor Res. 31(2):187–190

NORTHERN HAWK OWLS (*SURNIA ULULA CAPAROCH*) AND FOREST MANAGEMENT IN NORTH AMERICA: A REVIEW

PATRICIA A. DUNCAN
Box 253, Balmoral, Manitoba, Canada R0C 0H0

WAYNE C. HARRIS
Saskatchewan Environment and Resource Management, 350 Cheadle St. W., Swift Current, Saskatchewan, Canada S9H 4G3

ABSTRACT.—Northern Hawk Owl (*Surnia ulula caparoch*) populations in North America likely have been stable over the past 10–100+ yr. Population trends are impossible to quantify due to this species' remote breeding range, low breeding densities and erratic distribution and numbers during winter irruptions in inhabited areas. Mortality due to incidental trapping and shooting is unknown, but its diurnal habits and lack of fear of humans make it vulnerable to persecution. More than 50% of the hawk owl's breeding range occurs in northern forests that are currently noncommercial. Until recently, the majority of the hawk owl's breeding range was unaffected by forestry practices. In the last 20 yr, forestry activities have expanded in commercial northern forests. Modification of clear-cut logging practices have the potential to enhance hawk owl habitat. Variable-sized cuts of <100 ha, interspersed with forest patches and staggered over time, are thought to be optimal. If cuts contain suitable numbers of stumps, snags and trees for hunting perches and nest sites, they will offer year-round habitat. Other factors, such as cut shape and juxtaposition, are probably less important to this striking sentinel of our northernmost forests.

KEY WORDS: Surnia ulula; *North America; forest management; habitat use; Northern Hawk Owl.*

El Búho Halcón del norte *Surnia ulula caparoch* y administración forestal en Norte América: un reviso

RESUMEN.—Poblaciones de Búho Halcón *Surnia ulula caparoch* en norte américa ha estado estable en los últimos 10 a 100+ años. Tendencias de población están imposible para cuantificar por los campos remotos de cría de la especie, densidad baja de cría, y distribución y cantidad variable durante irrupciones del invierno en áreas inhabitadas. Mortalidad a causa de trampas y disparos es desconocido, pero sus costumbre de volar en el día y falta de tener miedo a gente lo hace vulnerable a persecución. Más de 50% de los campos de cría del Búho Halcón ocurren en bosques en el norte que están actualmente no-comercial. Hasta recientemente, la mayoría de campos de cría del Búho Halcón estaban sin afectación por costumbre de los forestales. En los últimos 20 años actividades forestales han expansionado en bosque comerciales en el norte. Modificaciones en costumbre de corta-completa tienen la potencia para aumentar hábitat de Búho Halcón. Cortadas variables de <100 ha, introducidas en parcelas de bosque escalonado con tiempo, es pensado ser óptimo. Si cortadas contienen cantidad conveniente de tocones, ramas sueltas y árboles con perchas de cazar y sitios de nido, pueden ofrecer un hábitat por todo el año. Otros factores, con forma de cortar y yuxtaposicion, es probable menos importante para este centinela de los bosques más norteños.

[Traducción de Raúl De La Garza, Jr.]

There are very few published papers on the ecology of the Northern Hawk Owl (*Surnia ulula*) in North America; this is in contrast to Europe where the majority of studies have been done (Clark et al. 1987). The intent of this paper is to review the literature regarding the effects of forestry on hawk owls in North America and to make management guidelines to maintain hawk owl populations. Unfortunately, the effects of forestry on the hawk owl are poorly understood and there are virtually no published reports on this subject. With this in mind, the management guidelines we have presented are hypothetical and based on the limited information that is available and from our own experiences in the field with this enigmatic owl. We have focused on the species in North America only and, by doing so, have pointed out the serious lack of information on hawk owls in the New World.

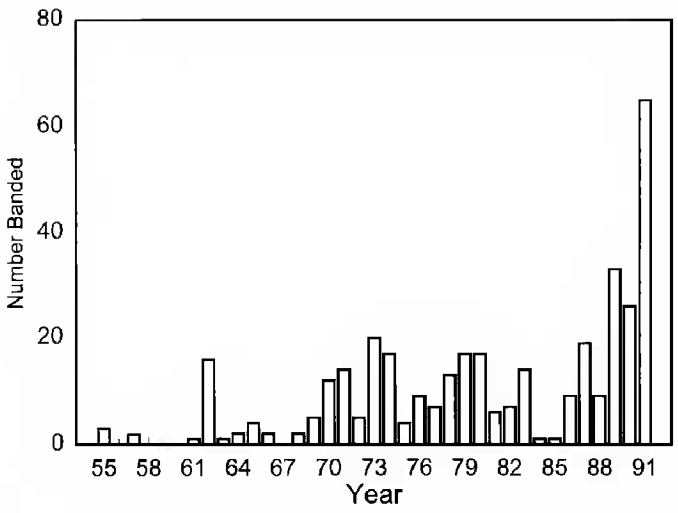

Figure 1. Number of Northern Hawk Owls banded during winter in North America, 1956–1992 ($N = 363$). Unpublished data from the Bird Banding Office, Canadian Wildlife Service, Ottawa, Canada.

Estimated Population Size and Trends

Accounts of Northern Hawk Owl population size and trends in North America are largely anecdotal. Trends are difficult to impossible to assess due to the remote breeding range, rare winter irruptions and low densities (Newton 1976). Fyfe (1976) reported that in the maritime provinces, the population trend was unknown and relative abundance was rare. For Ontario and southern Quebec, the trend was fluctuating, with relative abundance rare to low. The prairie provinces and British Columbia also reported fluctuating populations, with low to medium relative abundance. Analysis of Breeding Bird Survey data showed a nonsignificant decrease for Labrador and the central prairie provinces from 1966–77 to 1978–83 (Collins and Wendt 1989). The number of hawk owls banded between 1956–92 (Fig. 1) reflects low owl numbers, although banding effort was variable and not standardized (Canadian Wildlife Service data). Irruption years presumably relate to regional variation in food availability and hawk owl reproduction. Based on the hawk owl's North American breeding range (American Ornithologists' Union 1983), we hypothesize that its overall North American population has remained stable at 10 000–50 000 pairs over the past 10–100+ yr, with local or regional populations showing fluctuations in owl numbers.

Habitat Needs

Of the three major habitat regions (Rowe 1972) within the boreal forest, the northernmost Forest and Barren Region is likely where the majority of hawk owls occur and breed. This region is characterized by open, stunted forests interspersed with bogs and muskeg (Rowe 1972). Typical breeding habitat of the hawk owl is described as open to moderately dense coniferous or mixed coniferous-deciduous forests bordering marshes or other open areas, including those cleared by logging (American Ornithologists' Union 1983). In mountainous areas, its range extends to timberline as high as 2650 m elevation (Campbell et al. 1990). Open hunting areas such as muskegs, dry ridges, burn areas, clearings and swampy valleys or meadows with suitable perches also characterize breeding habitat. Areas with stumps, snags or dead trees with bare branches serving as hunting perches are favored; impenetrable spruce-fir forests are avoided (Henderson 1919, Smith 1970, Kertell 1986, Lane and Duncan 1987). Nest sites are located in cavities in decayed trees, open decayed hollows where tops have broken off (Lane and Duncan 1987) and rarely in stick nests or on cliffs (Bent 1938).

We believe forest regions south of its breeding range are important for the Northern Hawk Owl's survival during southward irruptions and for occasional breeding. The winter range of the hawk owl is more extensive than its breeding range (American Ornithologists' Union 1983). In winter, hawk owls may be found in wooded farmlands, open areas of parkland and prairie regions where haystacks, posts, trees or bushes are used as perches (Jones 1987). It also hunts in old burns, cutovers and riparian areas surrounded by agricultural land, old hay fields, open spruce forests and along roadsides with large rights-of-way (Lane and Duncan 1987, Rohner et al. 1995). Second growth woodlands and lake shores are used in British Columbia (Campbell et al. 1990).

Factors Associated with Trends

Long-term North American Population Trends. More than half of the breeding range of the hawk owl is currently noncommercial forest (Godfrey 1986). Therefore, one would expect that hawk owl populations have remained stable over the last 10–100+ yr.

Northern forests are subject to natural fires which usually are left unchecked if far from human settlements. Burns may benefit hawk owls because they are known to hunt and nest in old burns (Mindell 1983). In some habitats (e.g., deep sphagnum moss), small mammalian prey species frequently survive forest fires and populations recover

quickly (Kelsall et al. 1977). Fire suppression near populated areas or in areas with merchantable timber reduces the availability of suitable nest sites.

Hawk owls occur throughout the year in the commercial forest region of Canada (numbers and distribution varies year to year). During the past 20 yr, clear-cut harvesting in boreal forests has increased. In the short-term, hawk owls may be negatively affected by large cuts (>100 ha), where no perches remain within the cut, or later, by regenerating dense forests (Sonerud pers. comm.). The current trend in forestry is for more numerous, smaller clear-cuts. Given its preference for open areas for hunting and breeding, habitat has likely improved for the hawk owl as long as suitable hunting perches are available. However, expansion of current practices over many years may reduce habitat quality, (e.g., fewer late successional forests that provide nest sites).

Short-term Population and Local Fluctuation Trends. Northern Hawk Owl numbers fluctuate locally (Kertell 1986, Lane and Duncan 1987, Rohner et al. 1995). When prey populations crash, hawk owls may be forced to leave breeding areas and wander in search of food. Irruptions have been well documented in North America (Thompson 1891, Barrows 1912, Roberts 1932, Bernard and Klugow 1963, Green 1963, Lane and Duncan 1987, Speirs 1985).

Other Factors Associated with Population Trends. Reports of hawk owls in northern areas are infrequent and incidental; during southern irruptions the hawk owl is vulnerable to human-induced mortality (K. McKeever pers. comm.). Predators include the Great Horned Owl (*Bubo virginianus*), Northern Goshawk (*Accipiter gentilis*), marten (*Martes americana*), fisher (*Martes pennanti*) and weasels (*Mustela* spp.).

EFFECTS OF FORESTRY ON HAWK OWL HABITAT

Primary Effects. Logging practices have the potential to enhance hawk owl habitat. Because hawk owls prefer open habitat, cut-overs with perches attract them. Furthermore, if cut-overs contain enough stumps and trees for nest structures, they offer year-round habitat.

Secondary Effects. The secondary effects of forest harvesting include their impacts on prey populations such as meadow voles (*Microtus pennsylvanicus*). Meadow vole populations increase 3–18 yr after clear-cutting forests (Kirkland 1977, Parker 1989). In Saskatchewan, deer mice (*Peromyscus maniculatus*) are more abundant after clear-cutting than after fire.

Hypothetical Specific Forestry Effects. *Cut size.* There are no published studies on the influence of cut size on hawk owl habitat use. We hypothesize that suitable cuts should be <100 ha in size, interspersed with forest stands and staggered over time. Forest stands will provide hunting perches and nest sites, as well as cover.

Cut shape. We suspect that edge irregularity increases the availability of perches and provides cover as well as access to open foraging habitat.

Residuals. It is important to leave residuals such as live trees and dead snags for hunting perches and nest sites. Thus, small residual stands within cuts would be beneficial. Without these, the use of cut-over areas by hawk owls is limited to cut edges.

Phenology. We have observed hawk owls in Saskatchewan and Manitoba in 5–10 ha cuts from 3–10-yr-old. Bortolotti (pers. comm.) observed owls hunting in cuts 8–10-yr-old in Saskatchewan. In Ontario, Russell (pers. comm.) found disproportionate use of cuts that were 11–15-yr-old. The time lag in cut use by hunting hawk owls is likely a factor of prey availability. For example, Kirkland (1977) and Parker (1989) reported that meadow vole numbers increased 3–18 yr after harvest. Dense regeneration growth after approximately 20 yr would limit prey availability.

CONCLUSIONS

North American boreal forests are, for the most part, being harvested for the first time and are not intensively managed. Most regenerating cut-overs contain a variety of tree species. A noteworthy trend in North America is toward increasingly intensive forest management, resulting in reduced rotation ages and more homogeneous forest stands (Environment Canada data). It is expected that such a trend may negatively impact hawk owl populations, if no perches are left within these cut areas. Furthermore, as the demand for wood increases, forests in remote areas will be used. This will only emphasize the need to better integrate timber and wildlife management objectives into regional forest use plans.

We presume hawk owl populations to be stable in North America due to its remote range, about half of which is currently noncommercial forest. The species appears to use a variety of cut sizes and shapes, provided that hunting perches and breeding sites are retained. We emphasize the need for

further research on this boreal forest owl in North America. A lack of information on the ecology of the hawk owl and its responses to forestry practices precludes us from recommending definitive forest management guidelines or from forecasting its future status.

ACKNOWLEDGMENTS

James R. Duncan, Jeff S. Marks, Robert W. Nero, Dwight G. Smith and an anonymous person provided valuable comments that improved the manuscript.

LITERATURE CITED

AMERICAN ORNITHOLOGISTS' UNION. 1983. Check-list of North American birds. 6th ed. Am. Ornithol. Union, Washington, DC U.S.A.

BARROWS, W.B. 1912. Michigan bird life. Michigan Agricultural College, Lansing, MI U.S.A.

BENT, A.C. 1938. Life histories of North American birds of prey. Pt. 2. U.S. Natl. Mus. Bull. 170.

BERNARD, R.F. AND B. KLUGOW. 1963. Hawk Owls invade Wisconsin. *Passenger Pigeon* 47–50.

CAMPBELL, R.W., N.K. DAWE, I. MCTAGGART-COWAN, J.M. COOPER, G.W. KAISER AND M.C.E. MCNALL. 1990. The birds of British Columbia. Vol. II. Royal British Columbia Museum, Vancouver, Canada.

CLARK, R.J., D.G. SMITH AND L. KELSO. 1987. Distributional status and literature of northern forest owls. Pages 47–55 *in* R.W. Nero, R.J. Clark, R.J. Knapton and R.H. Hamre [EDS.], Biology and conservation of northern forest owls. USDA For. Ser. Gen. Tech. Rep. RM-142, Fort Collins, CO U.S.A.

COLLINS, B.T. AND J.S. WENDT. 1989. The breeding bird survey in Canada 1966–1983. Analysis of trends in breeding bird populations. Tech. Rep. Ser. No. 75, Canadian Wildlife Ser., Ottawa, Canada.

FYFE, R.W. 1976. Status of Canadian raptor populations. *Can. Field-Nat.* 90:370–375.

GODFREY, W.E. 1986. The birds of Canada. National Museum of Canada, Ottawa, Canada.

GREEN, J.C. 1963. Hawk Owl invasion, winter 1962–63. *Flicker* 35:77–78.

HENDERSON, A.D. 1919. Nesting of the American Hawk Owl. *Oologist* 36:59–63.

JONES, E.T. 1987. Observations of the Northern Hawk Owl in Alberta. Pages 149–151 *in* R.W. Nero, R.J. Clark, R.J. Knapton and R.H. Hamre [EDS.], Biology and conservation of northern forest owls. USDA For. Ser. Gen. Tech. Rep. RM-142, Fort Collins, CO U.S.A.

KERTELL, K. 1986. Reproductive biology of Northern Hawk Owls in Denali National Park, Alaska. *Raptor Res.* 20:91–101.

KELSALL, J.P., E.S. TELFER AND T.D. WRIGHT. 1977. The effects of fire on the ecology of the boreal forest, with particular reference to the Canadian north: a review and selected bibliography. Canadian Wildlife Ser. Occ. Pap. 32. Ottawa, Canada.

KIRKLAND, G.L. 1977. Responses of small mammals to the clear cutting of northern Appalachian forests. *J Mammal.* 58:600–609.

LANE, P.A. AND J.R. DUNCAN. 1987. Observations of Northern Hawk Owls nesting in Roseau County. *Loon* 59:165–174.

MINDELL, D.P. 1983. Nesting raptors in southwestern Alaska: status, distribution and aspects of biology. USDI Bureau Land Manage. Tech. Rep. 8, Anchorage, AK U.S.A.

NEWTON, I. 1976. Population limitation in diurnal raptors. *Can. Field-Nat.* 90:274–300.

PARKER, G.R. 1989. Effects of reforestation upon small mammal communities in New Brunswick. *Can. Field-Nat.* 103:509–519.

ROBERTS, T.S. 1932. The birds of Minnesota. Univ. Minnesota Press, Minneapolis, MN U.S.A.

ROHNER, C., J.N.M. SMITH, J. STROMAN, M. JOYCE, F.I. DOYLE AND R. BOONSTRA. 1995. Northern Hawk Owls in the nearctic boreal forest: prey selection and population consequences of multiple prey cycles. *Condor* 97:208–220.

ROWE, J.S. 1972. Forest regions of Canada. Canadian Forestry Ser. Publ. No. 1300. Dept. of the Environ., Ottawa, Canada.

SMITH, D.A. 1970. Observations on nesting hawk owls at the Mer Bleue, near Ottawa, Canada. *Can. Field-Nat.* 84:377–383.

SPEIRS, J.M. 1985. Birds of Ontario. Natural Heritage/ Natural History Inc., Toronto, Canada.

THOMPSON, E.E. 1891. The birds of Manitoba. Smithsonian Inst. Press, Washington, DC U.S.A.

Received 2 November 1995; accepted 5 March 1997